



T-104
2022

Course Specification



Course Title: Volumetric Analytical Chemistry
Course Code: 211CHEM -3
Program: Bachelor in Chemistry
Department: Chemistry
College: College of Science
Institution Jazan University (JU)
Version: T104 2022
Last Revision Date: 29 December 2022



Table of Contents:

Content	Page
A. General information about the course:	3
1. Teaching mode (mark all that apply)	4
2. Contact Hours (based on the academic semester)	4
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods	4
C. Course Content	5
D. Students Assessment Activities	6
E. Learning Resources and Facilities	6
1. References and Learning Resources	6
2. Required Facilities and equipment	7
F. Assessment of Course Quality	7
G. Specification Approval Data	8
H. Attachments.....	9
1- Practical Work.....	9
2- Blue Print	10



A. General information about the course:

Course Identification

1. Credit hours:

2. Course type

a. University ☐ College ☐ Department ☒ Track ☐ Others ☐

b. Required ☒ Elective ☐

3. Level/year at which this course is offered: Level 5
Year 2nd

4. Course general Description

Course Title	Course Number	Contact Hours (CU)		Credit unit (CU)	Year	Level	Pre-requisite
		Lec.	Prac.				
Volumetric Analytical Chemistry	211CHEM3	2	2	3	2	5	101CHEM4

The aim of this course is to study the theoretical and practical principles of the different methods of volumetric analysis

Course objectives: They are to identify the following:

- Basic principles of volumetric analysis
- Different units to express concentrations
- Different types of titrations and its applications
- Preparation of solutions with different concentrations

Syllabus: A-Theoretical contents

Basic principles and concepts of volumetric analysis. Different units of concentrations. Different types of titrations as neutralization, oxidation reduction, complexometric and precipitation titrations.

Syllabus: B-Practical contents

Selected experiments related to volumetric analysis

5. Pre-requirements for this course (if any): 101CHEM4

6. Co- requirements for this course (if any): None

7. Course Main Objective(s)

The aim of this course is to study the theoretical and practical principles of the different methods of volumetric analysis



1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	100
2.	E-learning		
3.	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	22
2.	Laboratory/Studio	22
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	44

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding; (Upon completion of the course, student will be able to)			
1.1	Demonstrate a broad understanding and critical view of the principles, classification and application of volumetric analysis. (I)	K(1.1)	lecture / discussion Seminars /presentation	Objective questions
1.2	Describe the essential facts, principles and theories dealing with neutralization, complexities, precipitation and oxidation reduction reactions. (I)	K(1.2)	lecture / discussion / Seminars /Individual presentation	Objective questions

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	Skills ; (Upon completion of the course, student will be able to)			
2.1	Demonstrate ability in critical thinking, numeracy, analytical reasoning, use graphs, charts for solving problems related to volumetric analysis topics. (I)	S(2.1)	lecture / discussion / Seminars / Individual presentation	Solving Problems & chart analysis & Essay questions
2.2	Apply their experimental basics and skills to use laboratory equipment, and classical techniques for carrying out titration experiments and to write a report representing the scientific data (I)	S(2.2)	Lab work, group work	Lab final exam / lab report rubric/ Objective questions
2.3	Examine lab safety background to follow proper procedures and regulations for safe handling and use of chemicals. (I)	S(2.3)	lab demonstrations / hands-on student learning activities	Safety exam

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to analytical chemistry, types of chemical analysis, some definitions for titrimetric methods and calculation of number of moles and equivalent weight.	3
2.	Unites for expressing concentration; normality, molarity, molality, percent, w/w, w/v, v/v%, part per million, part per billion and conversion between some concentration unites.	3
3.	Dilution of solutions, solution preparation, titrations based on acid-base reactions	3



4.	Simple titration curves (strong, weak acids versus strong , weak bases) ,complicated titration curves and calculation of pH during titrations	3
5.	Theory of acid-base indicators and titrations based on oxidation reduction reactions	3
6.	Titration curves of oxidation reduction reactions and applications.	3
7.	Titration based on complexation reactions, applications and titrations based on precipitation reaction.	3
8.	Revision	1
9.	Selected Experiments related to course topics.	22
Total		44

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework assignment	3-8	2 %
2.	Lecture Quizzes	4-6	3 %
3.	Mid-term exam	6-8	15 %
4.	LAB Sheet	11	7%
5.	Quiz in Safety	9-11	3%
6.	Final practical exam	11	10 %
7.	Lab report	Through semester	10 %
8.	Final Exam	12-14	50 %
9.	Total		100 %

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Quantitative Chemical Analysis, Daniel C. Harris, Charles A. Lucy Kate Parker publisher, 9th edition 2015.
Supportive References	Fundamentals of Analytical Chemistry” - by Douglas A. Skoog, Donald M. West, F. James Holler, and Stanley R. Crouch, Mary Finch publisher 9th edition 2013.
Electronic Materials	Some course contents and materials are posted on Black board sites
Other Learning Materials	<ul style="list-style-type: none"> https://book4you.org/book/3338575/951c19





- [https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_\(Analytical_Chemistry\)/Quantifying_Nature/Volumetric_Chemical_Analysis_\(Shiundu\)/14.2%3A_Learning_Activity](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Quantifying_Nature/Volumetric_Chemical_Analysis_(Shiundu)/14.2%3A_Learning_Activity)
- [https://chem.libretexts.org/Under_Construction/Purgatory/Book%3A_Analytical_Chemistry_2.0_\(Harvey\)/09_Titrimetric_Methods/9.4%3A_Redox_Titrations](https://chem.libretexts.org/Under_Construction/Purgatory/Book%3A_Analytical_Chemistry_2.0_(Harvey)/09_Titrimetric_Methods/9.4%3A_Redox_Titrations)
- [https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_\(Analytical_Chemistry\)/Quantifying_Nature/Volumetric_Chemical_Analysis_\(Shiundu\)/14.4%3A_Complex_ion_Equilibria_and_Complexometric_Titrations](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Quantifying_Nature/Volumetric_Chemical_Analysis_(Shiundu)/14.4%3A_Complex_ion_Equilibria_and_Complexometric_Titrations)
- <https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=volumetric+analysis&type=wiki>

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	<i>1 Lecture room(s) for groups of 50 students 1 Lab room(s) for groups of 25 students</i>
Technology equipment (projector, smart board, software)	<i>Smart board, Data show, Black board, internet</i>
Other equipment (depending on the nature of the specialty)	Laboratory glassware and equipment such as erlenmeyer flasks watch glass, graduated cylinder, volumetric flask, graduated pipette, volumetric buret and beakers, water bath, magnetic stirrer, Electronic balance and hot plate

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey (CES) <u>Indirect</u>
Effectiveness of students assessment	Instructor & Course coordinator	<u>Classroom evaluation (direct & indirect)</u>
Quality of learning resources	Program coordinator	<u>Indirect</u>
The extent to which CLOs have been achieved	Assessment committee	<u>Indirect</u>
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	Chemistry Department Council CHEMS2301
REFERENCE NO.	CHEMS230104
DATE	11/1/2023G – 18/06/1444H



H. Attachments

1- Practical Work

No	Title of Experiment	Tools, Chemicals, and equipment Needed in Experiments	Week
1.	Laboratory safety	None	1
2.	Solution preparation	Sodium carbonate, sodium chloride, Sulphuric Acid and hydrochloric acid	2
3.	Determination of normality and strength of unknown sodium hydroxide solution by oxalic acid	Sodium hydroxide, oxalic acid and phenolphthalein	3
4.	Determination of normality and strength of unknown hydrochloric acid by solution known Sodium hydroxide	Sodium hydroxide, hydrochloric acid, phenolphthalein and methyl orange	4
5.	Revision	Depending upon the selected experiment	5
6.	Determination of normality and strength of unknown sodium carbonate solution by standardized Hydrochloric acid solution	sodium carbonate, Hydrochloric acid, phenolphthalein and methyl orange	6
7.	Determination of normality and strength of unknown potassium permanganate solution by standard oxalic acid solution	potassium permanganate, oxalic acid, Sulphuric Acid	7
8.	Determination of normality and strength of unknown ammonium ferrous sulphate solution by standard potassium dichromate solution	potassium dichromate solution, ammonium ferrous sulphate, sulphuric acid, phosphoric acid and diphenyl amine	8
9.	Determination normality and strength of sodium thiosulfate using standard solution of potassium dichromate (iodometric titration)	Sodium thiosulphate, potassium dichromate	9
10.	Determination normality and strength of magnesium sulphate using standard solution of EDTA (complexometry)	EDTA and magnesium sulphate	10
11.	FINAL EXAM		11



2- Blue Print

Course Name	Volumetric Analytical Chemistry
Course Code	211CHEM -3

PLOs	K1	K2	S1	S2	S3	S4	V1	V2
CLOs	1.1	1.2	2.1	2.2	2.3	-	-	-
Marks	30	25	15	27	3	-	-	-

Learning Domain	PLOs	CLOs	Assessment Type	Assessment Tool	No of Questions	Marks of the Assessment	Weight of the Assessment
Knowledge & understanding	K1	1.1 (30M)	Quiz	Objective Questions	2	2	1
			Mid term	Objective Questions	3	7	7
			Final Exam	Objective Questions	5	22	22
	K2	1.2 (25M)	Quiz	Objective & Essay Questions	2	2	1
			Mid term	Objective & Essay Questions	3	6	6
			Final Exam	Objective & Essay Questions	6	18	18
Skills	S1	2.1 (15M)	H.W	Solving Problems & chart analysis & Essay questions	4	2	2
			Quiz	Solving Problems & chart analysis & Essay questions	2	2	1
			Mid term	Solving Problems & chart analysis & Essay questions	2	2	2
			Final Exam	Solving Problems & chart analysis & Essay questions	4	10	10
	S2	2.2 (27M)	Practical Sheet	Objective Questions	2	14	7
			Lab Report	Lab Report Rubric	5	10	10
			Final Lab Exam	I Task experiment	1	10	10
	S3	2.3 (3M)	Safety Quiz	Objective questions	1	6	3
	TOTAL		100				100



